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January 31, 2008

To: Environmental Protection Agency
Cincinnati Procurement Operations Division
26 West Martin Luther King Drive
Cincinnati, OH 45268

Attention: Ms. Tammy Thomas
Contract Officer

0-01 Amm. 4

From: Kevin Whitney
Spark Ignition Powertrain Department
Southwest Research Institute
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Subject: Work Plan for Amendment 4 of Work Assignment 0-01, EPA Contract EP-C-07-028, under SwRI Project 03.13363, SwRI Proposal No. 03-50782B.

Contract Title: "Testing and Related Support for Energy Bill-Mandated Activities"

Assignment Title: "Comprehensive Gasoline Light Duty Exhaust Fuel Effects Test Program to Cover Multiple Fuel Properties and Two Ambient Test Temperatures"

1.0 INTRODUCTION

As per Amendment 3.

2.0 TECHNICAL DISCUSSION

As per Amendment 3.

3.0 SCOPE OF WORK

This work assignment requires that SwRI procure 19 suitable test vehicles and 19 test fuels. Two additional options include measurements with an FTIR during Phases 2 and 3 of the program. It should be noted that the budget estimate attached to this Work Plan is for the first year of the contract only. Budgetary cost estimates for options are provided in Section 6.0. Details of the project are presented below.

3.1 Work Plan Development

As per Amendment 3.

3.2 Quality Assurance Project Plan and Quality Management Plan (QAPP/QMP)

SwRI will submit a Quality Assurance Project Plan (QAPP) to the EPA Work Assignment Manager for approval. The QAPP will be submitted by February 13, 2008.

3.3 Vehicle Recruitment

SwRI will lease 19 test vehicles, all equipped with automatic transmissions and two-wheel drive, as listed in Table 1. New vehicles will be leased for a two-year period. It should be noted that the budget for the first year of the contract includes a commitment for the full two years of vehicle leases. Additionally, the attached cost estimate for the first year of the contract assumes the vehicles will not be kept beyond the expiration of the 2-year lease. The attached budget assumes that vehicle leases will start in January 2008.

All vehicles will meet the requirements specified in Table 1. Additionally, only vehicles whose owner's manuals recommend the use of regular gasoline shall be recruited for this program. If model year 2007 vehicles are not available, 2008 model year vehicles will be substituted provided that these vehicles are certified at levels at or below those indicated for the 2007 model year vehicles listed in Table 1. If model year 2008 vehicles are selected, SwRI will submit engine family data to the EPA WAM for confirmation and approval prior to recruiting any vehicles.

TABLE 1. TEST VEHICLES FOR RECRUITMENT

MAKE	YEAR	BRAND	MODEL	ENGINE	FAMILY	T2 BIN	NOTE
GM	2007	Chevrolet	Cobalt/HHR	2.4L I4	7GMXV02.4029	5	
GM	2007	Chevrolet	Impala	3.5L V6	7GMXV03.5052	5	FFV
GM	2007	Buick/GMC/Saturn	Enclave/Acadia/Outlook	3.6L V6	7GMXT03.6151	5	
GM	2007	Chevrolet/GMC	Avalanche	5.3L V8	7GMXT05.3381	4	FFV
Toyota	2007	Toyota	Corolla	1.8L I4	7TYXV01.8BEA	5	
Toyota	2007	Toyota	Camry	2.4L I4	7TYXV02.4BEB	5	
Toyota	2007	Toyota	Sienna	3.3L V6	7TYXT03.3BEM	5	
Toyota	2007	Toyota	Tundra	4.0L V6	7TYXT04.0AEV	5	
Ford	2007	Ford	Focus	2.0L I4	7FMXV02.0VD4	4	
Ford	2007	Ford	500/ Taurus/Freestyle	3.0L V6	7FMXV03.0VED	5	
Ford	2007	Ford/Mercury	Explorer/Mountaineer	4.0L V6	7FMXT04.03DB	4	
Ford	2007	Ford	F150	5.4L V8	7FMXT05.44H2	8	FFV
Chrysler	2007	Dodge	Caliber	2.4L I4	7CRXB0144M80	5	
Chrysler	2007	Dodge/Chrysler	Caravan/Town & Country	3.3L V6	7CRXT03.3NHP	8	FFV
Chrysler	2007	Jeep	Liberty	3.7L V6	7CRXT03.7NE0	5	
Honda	2007	Honda	Civic	1.8L I4	7HNXV01.8MKR	5	
Honda	2007	Honda	Accord	2.4L I4	7HNXV02.4KKC	5	
Honda	2007	Honda	Odyssey	3.5L V6	7HNXT03.5VKR or 7HNXT03.5WKR	5	either family
Nissan	2007	Nissan	Altima	2.5L I4	7NSXV02.5G5A	5	

3.4 Test Lubricants

As per Amendment 3.

3.5 Test Fuels

SwRI will procure and store all 19 test fuels for this program. To date, only Haltermann Products has expressed a willingness and ability to provide the test fuels for this program. SwRI anticipates needing ten (10) 55-gallon drums of each test fuel. For contingency purposes, this amount includes approximately 50 percent more fuel than will be needed to complete the program. The attached budget assumes that Fuels 17, 18, and 19 will be delivered, approved, and available for testing by the end of March 2008.

In addition to the fuel amounts listed above, another 200 gallons each of fuels 17, 18, and 19 will be prepared and shipped to EPA's facility in Ann Arbor, Michigan after they have been blended and approved by the WAM.

SwRI has indicated to Haltermann that test fuels will be blended exclusively from refinery components and cuts of refinery components. Special chemicals and chemical blendstocks will not be used. However, butane and benzene may be used to adjust RVP and benzene content of these

fuels, respectively. Furthermore, sulfur content of the fuels may be adjusted using a three-component sulfur mixture containing 4.3 mass % of dimethyl disulfide, 22.8 mass % of thiophene and 72.9 mass % of benzothiophene. An oxidation inhibitor will be added to all finished test fuels. Haltermann has indicated that they expect to be able to meet these requirements.

It is understood that all ethanol-containing fuels should be prepared using denatured ethanol meeting the requirements of ASTM D4806 standard. The properties of all ethanol-containing fuels will be reported on a total sample basis (e.g. hydrocarbon type content by ASTM D1319 will be corrected for ethanol content in the fuel). An oxidation inhibitor shall be added to all finished test fuels.

Hand blend inspection data for every test fuel will be presented to the EPA WAM for review. Final blending will not proceed unless authorized by the EPA WAM. Final blend inspection data generated by Haltermann will be forwarded to the EPA WAM for review prior to the shipment of these fuels for use in this test program. The shipment of the fuels to SwRI and their use in this program will not proceed unless authorized by the EPA WAM. Once a fuel has been accepted for testing, a 5 gallon sample shall be shipped to EPA for use in an audit and/or a round robin program.

Once the fuels are received, SwRI will conduct a limited set of analyticals (to be determined) on a single drum sample of each fuel. Additional analyses (to be determined) will be conducted on a single drum sample of each fuel at the midpoint and end of the program to determine whether any fuel properties have changed as a result of fuel storage and handling.

To assure that no drums are mislabeled, fuel properties will be confirmed when each drum is opened using a Petrospec analyzer. Additionally, all drums will be receive a unique alphanumeric label and each time a vehicle is fueled the alphanumeric code will be recorded.

It is understood that test fuel should not be stored outside, and should be maintained in sealed 5B drums at a constant temperature of no more than 75°F (nominal). SwRI currently has capacity to store approximately 40 to 50 drums at 45°F (nominal), and another 75 to 100 drums at room temperature. SwRI estimates that approximately 190 drums of fuel will be needed for this project.

SwRI does not currently have the capacity to store all the test fuels at the requested temperatures. We are currently pursuing efforts to increase our on-site temperature-controlled fuel storage capacity in order to meet the needs of this project. We expect that facilities will be available to handle the amount of fuel needed to conduct the Work Assignment. However, at this time we can not yet guarantee the availability of sufficient temperature-controlled storage capacity to meet the needs of this project. For this Work Plan, the budget assumes that SwRI will have the necessary facilities in place by the time the fuel is delivered. If this is not the case, however, the project may incur additional costs in order to accommodate EPA's requested fuel storage conditions.

3.6 Vehicle Preparation

New vehicles will be leased for this program. Upon receipt, vehicles will undergo a thorough inspection. This includes inspection of the engine, transmission, axles, exhaust system and tires, and verification that no OBD2 faults are set. Photographs of exhaust system layout will also be taken. Additionally, vehicle information will be collected and recorded for entry into MSOD data tables, as described in Appendix C of the Statement of Work.

Following the inspection, a single FTP test will be performed on each vehicle using a baseline fuel (to be determined). Phase-level measurements of total hydrocarbon (THC), non-methane hydrocarbon (NMHC), oxides of nitrogen (NO_x), carbon monoxide (CO), particulate matter (PM), and carbon dioxide (CO_2) emissions will be submitted to the EPA WAM for review to determine each vehicle's acceptability as a candidate for the test program. SwRI and EPA agree that there is a low probability of finding a new vehicle that is unacceptable for this program. If such a case were to occur, the project would incur additional costs to remedy the situation. It should be noted that the results of initial FTPs may not reflect stable vehicle operation following 4,000 miles of operation.

Each vehicle approved by the EPA WAM will then undergo initial crankcase oil and oil filter replacements. Oil filters will be procured by SwRI per manufacturer's recommendations. Oil will be drained and replaced with one of the EPA-supplied lubricants per the vehicle manufacturer's viscosity requirements. Following an oil and filter change, each vehicle will be brought up to 4,000 odometer miles to eliminate any engine break-in issues. This will be accomplished by operating the vehicles on mileage accumulation dynamometers over the Standard Road Cycle using a non-oxygenated, commercial, 87 octane gasoline. At the 2,000-mile odometer reading during this accumulation, the crankcase oil and oil filter will be replaced a second time. To accommodate subsequent oil samples, the sump will be overfilled by 12 oz. The vehicle will then be driven to make sure that fresh oil and the remainder of used oil have mixed well in the sump and a 4 oz. sample of oil will be taken from the engine. The lubricant level in the sump will be allowed to stabilize and its level indicated on the dipstick will be recorded. Mileage accumulation will then resume and continue until an odometer reading of 4,000 miles is attained. The oil sample will be shipped immediately to the following address:

Lubrizol Corporation
1275 Lloyd Road (Bldg 8)
Wicliffe, OH 44092
Attn: Dr. Ewa Bardasz

Following mileage accumulation and lubricant conditioning, each new vehicle shall once again undergo thorough inspection of the engine, transmission, axles, exhaust system and tires, and verification that no OBD2 faults are set. At that time, the second 4 oz. engine oil sample shall be taken and shipped to Lubrizol.

Additional 4 oz. engine oil samples will be taken and shipped to Lubrizol following emissions testing of the 4th, 14th and 25th fuel in the Phase 3 test sequence of each vehicle.

If a vehicle is equipped with traction control, it will be disabled either through an interior disable button or other method (remove power fuse to anti-lock brake system (ABS)), and a placard will be placed in the vehicle indicating the method of disabling traction control if driver input is required.

Chassis dynamometer settings will be derived from target road load coefficients as reported in EPA's on-line Test Car List Data Files. Each vehicle will use the same chassis dyno settings during both 75°F and 50°F tests. Target road load coefficients and subsequently-derived chassis dyno settings will be submitted to the EPA WAM for approval prior to the initiation of testing.

3.7 Vehicle Testing

All vehicles will be tested on all test fuels using the California Unified Cycle (LA92). For this program, the LA92 will be conducted as a three-phase, cold-start test in a manner similar to the FTP, including ambient conditions. All tests on a given vehicle will be conducted using the same 48-inch single roll electric chassis dynamometer. It is expected that a single test site will be used for this entire program. The same driver will be used for all tests on a given vehicle; however, it may be necessary to use more than one driver in the program.

Prior to any emission test conducted in this program, the representative bulk oil temperature in the sump will be stabilized within ±3°F of the nominal test temperature, 50 ± 3°F or 72.5 ± 2.5°F. The representative oil temperature is defined in 40 CFR Part 86.232-94.

Limited testing will also be conducted at 50°F. SwRI does not currently have these facilities in place, but we are pursuing what we believe to be a viable temporary solution to meet the needs of this project. Ex. 4 - CBI

Ex. 4 - CBI

However, if additional effort is required beyond what is currently anticipated, it could result in additional project costs.

Each vehicle shall be tested at least twice on a given fuel at each test. After two tests have been completed and the acquired data have passed all quality control verifications, the need for a third test will be determined by following the variability criteria shown in Table 2. If the ratio of any of the criteria pollutants (CO_2, NO_X, NMHC) on a pair of tests for a given vehicle/fuel/temperature combination exceeds the levels shown in Table 2, a third test will be conducted. If a third test is needed, the EPA WAM will be notified (typically within 24 hours) and the summary data for the test pair in question will be provided. For budgeting purposes, this Work Plan assumes that 5 percent of all test pairs will require a third test. If the actual need to conduct a third test exceeds the 5-percent allocation, the project will incur additional costs.

TABLE 2. VARIABILITY CRITERIA FOR TRIPLICATE TESTING

Dilute Gaseous Emission	Criteria for requiring a third test (composite cycle emissions)
CO_2	Ratio of higher / lower > 1.04
NOx	Ratio of higher / lower > 1.81
NMHC	Ratio of higher / lower > 1.67

Ex. 4 - CBI

3.7.1 Fuel Change and Test Execution Sequence

SwRI will follow the fuel change and test execution sequence as described in Table 3 below. Replicate tests of a given fuel in a particular vehicle will be done back-to-back. The second replicate will be run in the same way as the first except that only THC, NMHC, NMOG (calculated as given in Section 3.7.5), CO, CO_2, NO_x, NO (for determination of NO_2 by difference), ethanol, and PM emissions will be determined from dilute exhaust samples. If the difference between CO_2, NO_X, or NMHC results in any set of two replicates is greater than the variability criteria listed in Table 2, on the following day a third replicate will be run in the same way as the second. This

"back-to-back" testing eliminates the need to repeat additional vehicle preconditioning between each replicate test on a given fuel.

TABLE 3. FUEL CHANGE AND TEST EXECUTION SEQUENCE FOR OPTION A

STEP	DESCRIPTION
1	Drain vehicle fuel completely via fuel rail whenever possible.
2	Turn vehicle ignition to RUN position for 30 seconds to allow controls to allow fuel level reading to stabilize. Confirm the return of fuel gauge reading to zero.
3	Fill fuel tank to 40% with next test fuel in sequence. Fill-up fuel must be at the temperature of the next LA92 test (75 or 50°F).
4	Start vehicle and execute catalyst sulfur removal procedure described in Appendix C of CRC E-60 Program report. Engine oil temperature in the sump will be measured and recorded during the sulfur removal cycle.
5	Drain fuel and refill to 40% with test fuel. Fill-up fuel must be at the temperature of the next LA92 test (75 or 50°F)
6	Start vehicle and drive one LA4 cycle. Allow vehicle to idle in park for 2 minutes before engine shut-down.
7	Move vehicle to soak area without starting or driving.
8	Park vehicle in soak area at proper temperature (75 or 50°F) for 12-36 hours.
9	Move vehicle to test area without starting engine.
10	Perform LA92 cycle emissions test.
11	Park vehicle in soak area of proper temperature for 12-36 hours.
12	Move vehicle to test area without driving.
13	Perform LA92 emissions test.
14	Determine whether third replicate is necessary, based on data variability criteria (see Table 2).
15	If a third replicate is required, repeat steps 11, 12 and 13.
16	If third replicate is not required, return to step 1 and proceed with next fuel in test sequence.

3.7.2 Test Sequence

The emission test program will be executed in the following sequence:

- Phase 1: Fuels 17, 18 and 19 tested in all vehicles at 75°F
- Phase 2: Fuels 17, 18 and 19 tested in all vehicles at 50°F
- Phase 3: Fuels 1-16 tested in all vehicles at 75°F

In Phases 1 and 2 of the program, the test fuels will be tested in each vehicle in the following sequence: Fuel 17 (E0) followed by Fuel 18 (E10) and then Fuel 19 (E15).

In Phase 3 of the program, the order in which the various test fuel and vehicle combinations are to be tested will be randomized. However, replicate tests of a given fuel in a particular vehicle will be done back-to-back. Specifically, the vehicle will be tested twice (3 times if determined

necessary per emissions variability criteria provided in Table 2 above) on a given fuel before moving on to the next test fuel in the matrix. This "back-to-back" testing eliminates the need to repeat additional vehicle preps (Steps 1-6 of Table 3 above) between each replicate test on a given fuel.

It is expected that Phase 1 testing will begin in April 2008. SwRI anticipates being able to complete all of Phase 1 during the first year of the contract.

Following completion of Phase 1, it is expected that approximately two weeks will be needed to prepare for Phase 2 testing at 50°F. Pending successful installation and operation of the equipment necessary to conduct testing at 50°F, SwRI anticipates being able to complete approximately 50 percent of Phase 2 during the first year of the contract. The remainder of Phase 2 will be competed in the second year of the contract.

It is expected that Phase 3 will begin approximately two weeks following the completion of Phase 2. Assuming Phases 1 and 2 are completed as expected, SwRI anticipates that Phase 3 testing of Fuels 1 through 16 could be completed in February 2009.

3.7.3 Determination of Phase Level and Continuous Regulated Emissions

Phase-level (bag-by-bag) emissions to be determined and reported, and light-duty FTP weighting factors shall be used to calculate composite emissions. The following emissions rates will be determined:

- total hydrocarbons (THC)
- non-methane hydrocarbons (NMHC)
- non-methane organic gases (NMOG) as specified in Section 3.7.6 below
- oxides of nitrogen (NO_X)
- nitrogen dioxide (NO_2) will be determined by the difference of measured NO and NO_X values – expected detection limit approximately 50 ppb
- carbon monoxide (CO)
- carbon dioxide (CO_2)
- particulate matter (PM)
- ethanol

For the first test of each set of replicates, THC, NMHC, CO, CO_2 and NO_X, emissions will also be determined on a continuous basis (1 Hz minimum) from raw "modal" samples at the tailpipe position only. These measurements will be made for all fuels. The Statement of Work indicates that direct measurement of exhaust flow should be used to determine continuous mass emission rates. At this time, SwRI does not have the capacity to use a direct exhaust measurement device for the determination of modal emissions. However, we are purchasing a SEMTECH EFM from Sensors Inc. to be integrated into the test site for direct measurement of exhaust flow. It is expected that this equipment will be installed and verified prior to the initiation of testing in April 2008.

Additionally, available data will be acquired from each vehicle's onboard diagnostic (OBD) system during all emissions tests using a DBK70 data acquisition system. Phase level and total test cycle work measured by the chassis dyno will also be determined and reported.

It is expected that the test facilities for testing will meet the requirements of 40 CFR Part 86 Subpart B and 40 CFR Part 86 Subpart C as they apply to vehicle exhaust emissions testing. It is also expected that THC, NMHC, NO_x, CO, and CO_2, and PM emissions sampling and measurement would be conducted as specified in 40 CFR 1065. It should be noted, however, that the current test cell has not been fully reviewed for Part 1065 compliance. It is compliant to Part 86, Subpart B. If some aspect of testing will need to be done in variance to Part 1065, SwRI will bring this to the attention of the EPA WAM, and will describe how such a variance might impact the test results. Variances must be approved the EPA WAM before testing may begin.

3.7.4 Speciation of Volatile Organic Compounds

Phase-level (bag-by-bag) speciated VOCs will include C_1-C_{12} hydrocarbons as well as light alcohols, aldehydes, and ketones. Sampling and analysis of C_2-C_{12} hydrocarbons will be conducted in a manner similar to CARB method 1002/1003, "Procedure for the Determination of C_2-C_{12} Hydrocarbons in Automotive Exhaust Samples by Gas Chromatography". Sampling and analysis of carbonyl compounds will be conducted in a manner similar to CARB method 1004, "Determination of Aldehyde and Ketone compounds in Automotive Source Samples by High Performance Liquid Chromatography". Analysis of C_1 – C_4 HC samples will be done within one hour of completion of the emissions test. Subsequent analysis of the additional compounds of interest will be done within 4 hours of emission test completion. The time between sample collection and the start of C_1-C_4 HC analysis will be reported. The VOCs to be analyzed are identified in Appendix D of the Statement of Work.

Sampling and analysis of light alcohols will be accomplished by bubbling exhaust through glass impingers containing deionized water and analyzing samples with a gas chromatograph. Analysis will include the following compounds: methanol, ethanol, isopropanol, n-propanol, and tert-butanol (2-methyl-2-propanol).

In Phases 1, 2, and 3 of the program, VOC speciation will be performed for all 3 test phases of the LA92 cycle, on all fuels (3 fuels in Phases 1 and 2 and 16 fuels in Phase 3), for a subset of 3 vehicles (vehicles to be selected by the EPA WAM). This includes all repeat tests, and is outlined graphically in Table 4, below.

TABLE 4. VOC SPECIATION SUMMARY FOR 3 VEHICLES IN PROGRAM PHASES 1, 2, AND 3

LA92 Test Phase (bag)	LA92 Test Repeat		
	Test 1	Test 2	Test 3 (if needed)
Phase 1	C_1-C_{12} Speciation Light Alcohols Carbonyls	C_1-C_{12} Speciation Light Alcohols Carbonyls	C_1-C_{12} Speciation Light Alcohols Carbonyls
Phase 2	C_1-C_{12} Speciation Light Alcohols Carbonyls	C_1-C_{12} Speciation Light Alcohols Carbonyls	C1-C12 Speciation Light Alcohols Carbonyls
Phase 3	C_1-C_{12} Speciation Light Alcohols Carbonyls	C_1-C_{12} Speciation Light Alcohols Carbonyls	C1-C12 Speciation Light Alcohols Carbonyls

VOC speciation for the remaining 16 vehicles will only be conducted on samples from Phase 1 of the LA92 test for all 19 fuels tested at room temperature (3 fuels in Phase 1 and 2 and 16 fuels in Phase 3). This also includes all repeat tests and is outlined graphically in Table 5, below.

TABLE 5. VOC SPECIATION SUMMARY FOR 16 VEHICLES IN PROGRAM PHASES 1, 2, AND 3

LA92 Test Phase (bag)	LA92 Test Repeat		
	Test 1	Test 2	Test 3 (if needed)
Phase 1	C_1-C_{12} Speciation Light Alcohols Carbonyls	C_1-C_{12} Speciation Light Alcohols Carbonyls	C_1-C_{12} Speciation Light Alcohols Carbonyls
Phase 2	none	none	none
Phase 3	none	none	none

3.7.5 Determination of NMOG

As per Amendment 3.

3.7.6 Continuous Measurements of N_2O, NH_3 and HCN

Continuous and phase-integrated emissions of N_2O, NH_3 and HCN will be measured using Fourier Transform Infrared Spectroscopy (FTIR), only during Phase 1 of the program. These measurements will only be taken during the first test of each fuel/vehicle combination and no repeat measurements will be conducted.

As an option, continuous and integrated by bag (phase) emissions of N_2O, NH_3 and HCN could be measured by FTIR in Phase 2 of the program. An additional option includes conducting these FTIR measurements during E85 tests in four FFVs in Phase 3 of the program. Cost estimates for these options are given in Section 6.0.

4.0 REPORTING AND DELIVERABLES

4.1 Weekly Reports

As per Amendment 3.

4.2 Monthly Written Progress Reports

SwRI will provide monthly progress reports. Invoices will be provided every four weeks according to the existing contract. The monthly progress reports will include information from the most recent invoice. The reports will track percentages of hours used in each task and whether the project is on schedule. They will explain problems encountered including resolutions and indicate if the schedule or budget is affected. Additionally, SwRI will submit monthly technical progress reports. These reports will cover each calendar month of the contract performance and detail work accomplished, any problems or delays encountered. Technical progress reports will be issued within fifteen (15) calendar days after the end of each reporting period.

4.3 Data Files

SwRI will submit the data to EPA in three formats, each format having different levels of post processing and aggregation. The files are nominally:

1. Non-Post processed data files (raw data): These are the native test level data files, usually generated by instrumentation, that have not been post-processed for such purposes as time-series alignment or calculation of continuous emission rates. They will be submitted to EPA as a deliverable for this work assignment and labeled using the following convention:

   'e'<*VehID*>_<*fuelID*>_raw.<*extension*>

   where *VehID* is the unique identifier designated for vehicle, *fuelID* is the unique identifier assigned to each fuel type, and *extension* is the appropriate file extension for the file's data format. Modifications to the specified file-naming convention may be adopted following approval from the EPA Work Assignment Manager.

2. Post processed data files: These are the minimally processed test level data files that will contain the composite, test level, bag level, and 1 Hertz (modal) emission rates in the units specified in 40 CFR Part 86. They will be submitted to EPA as a deliverable for this work assignment and labeled using the following convention:

   'e'<*VehID*>_<*fuelID*>_pst.<*extension*>

where *VehID* is the unique identifier designated for vehicle, *fuelID* is the unique identifier assigned to each fuel type, and *extension* is the appropriate file extension for the file's data format Modifications to the specified file-naming convention may be adopted following approval from the EPA WAM.

3. SwRI will also deliver Mobile Source Observation Database (MSOD) input data files containing test results and vehicle information using table names, structures, field names and field formats as specified in Appendix C of the Statement of Work. During the program it may be necessary to design and apply new data types, tables and structures. As necessary, such modifications to the data structure would be approved by the EPA WAM.

Additionally, SwRI will submit ASCII-formatted data files that include engine oil sump temperature recorded during each sulfur removal cycle.

4.4 Mode of Delivery

As per Amendment 3.

4.5 Draft Final Report

As per Amendment 3.

4.6 Final Report

As per Amendment 3.

5.0 STAFF ASSIGNMENTS

As per Amendment 3.

6.0 PROJECTED LABOR HOURS AND OTHER DIRECT COSTS

Based on our understanding of Amendment 4 to Work Assignment 0-01, we project the breakdown of employee utilization by labor category as detailed in Table 6 for the first year of the contract. Complete cost detail for the first year's effort is presented in the attached cost breakdown shown in Appendix A. Estimates for other direct costs are shown in Table 7. Table 8 contains cost estimates for optional FTIR measurements during Phases 2 and 3 of the test program.

TABLE 6. PROJECTED LABOR HOURS FOR AMENDMENT 4 TO WORK ASSIGNMENT 0-01; FIRST YEAR OF CONTRACT

LABOR CATEGORY	NUMBER OF HOURS
PL4	Ex. 4 - CBI
PL3	
PL2	
PL1	
Senior Technical	
Technical	
Clerical	
Total	
Total Technical Hours	

TABLE 7. PROJECTED OTHER DIRECT COSTS FOR AMENDMENT 4 TO WORK ASSIGNMENT 0-01; FIRST YEAR OF CONTACT

ITEM	PROJECTED OTHER DIRECT COSTS
24-month vehicle lease for 19 vehicles	Ex. 4 - CBI
Chart paper	
Exhaust pipe, flanges	
Fuel	
Fuel analyses	
GC supplies	
Glassware	
Misc. chemical	
Misc. electrical	
Misc. mechanical	
Nitrogen, zero air	
Particulate filters	
Span gases	
Steel and teflon tubing	
Swedgelock fittings	
Tedlar bags	
Vehicle maintenance sets	
TOTAL	

TABLE 8. BUDGETARY COST ESTIMATE FOR OPTIONS

OPTION	Estimated Cost
Optional FTIR Measurements During Phase 2 of the Test Program	Ex. 4 - CBI
Optional FTIR Measurements During Phase 3 of the Test Program	

8.0 EXCEPTIONS

As per Amendment 3.

9.0 SUMMARY

Southwest Research Institute has responded to Amendment 4 to Work Assignment 0-01 with exceptions as noted in Section 8.0 above. Should any questions of a technical nature arise, please contact Mr. Kevin Whitney at 210-522-5869 or Mr. Patrick Merritt at 210-522-5422. If there are questions regarding cost or contractual issues, please contact Ms. Sherry Twilligear at 210-522-3948. Thank you for this opportunity to be of service.

Prepared by:

Kevin A. Whitney
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Light-Duty Vehicle Emissions

Reviewed and submitted:

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Mr. Rafal Sobotowski, Alternate WAM, EPA-AA
Ms. Sherry Twilligear, SwRI Contracts

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APPENDIX A

COST DETAIL FOR AMENDMENT 4 TO WORK ASSIGNMENT 0-01

Ex. 4 - CBI

Ex. 4 - CBI

Ex. 4 - CBI